

## COMMON HALF YEARLY EXAMINATION - 2022

Standard XI

Reg.No.

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## BUSINESS MATHEMATICS &amp; STATISTICS

Time: 3.00 hours

Marks: 90

## Part - I

## I Choose the correct answer

20 x 1 = 20

- A be a non-singular matrix then  
a)  $AA^T = I$       b)  $A^2 = I$       c)  $A = A^T$       d)  $A^{-1} = I$
- If A and B non-singular matrix then which of the following is incorrect?  
a)  $A^2 = I$  implies  $A^{-1} = A$       b)  $I^{-1} = I$   
c) If  $Ax = B$  then  $x = B^{-1}A$   
d) If A is square matrix of order 3 then  $|\text{adj } A| = |A|^2$
- The term containing  $x^3$  in the expansion of  $(x - 2y)^7$  is  
a) 3<sup>rd</sup>      b) 4<sup>th</sup>      c) 5<sup>th</sup>      d) 6<sup>th</sup>
- Sum of the binomial coefficients in the expansion of  $(1 + x)^n$  is  
a)  $2^n$       b)  $n^2$       c)  $2n$       d)  $n + 17$
- The slope of the line  $7x + 5y - 8 = 0$  is  
a)  $\frac{7}{5}$       b)  $-\frac{7}{5}$       c)  $\frac{5}{7}$       d)  $-\frac{5}{7}$
- The focus of the parabola  $x^2 = 16y$  is  
a) (4,0)      b) (-4,0)      c) (0,4)      d) (0,-4)
- The value of  $1 - 2 \sin^2 45^\circ$  is  
a) 1      b)  $\frac{1}{2}$       c)  $\frac{1}{4}$       d) 0
- The value of  $\frac{1}{\text{cosec}(-45^\circ)}$  is  
a)  $-\frac{1}{\sqrt{2}}$       b)  $\frac{1}{\sqrt{2}}$       c)  $\sqrt{2}$       d)  $-\sqrt{2}$
- The minimum value of the function  $f(x) = |x|$  is  
a) 0      b) -1      c) 1      d)  $-\infty$
- The value of e lies between  
a)  $1 < e < 2$       b)  $3 < e < 4$       c)  $-1 < e < 1$       d)  $2 < e < 3$
- The elasticity of demand for the demand function  $x = \frac{1}{p}$  is  
a) 0      b) 1      c)  $-\frac{1}{p}$       d)  $\infty$
- If  $u = x^3 + 3xy^2 + y^3$  then  $\frac{\partial^2 u}{\partial y \partial x}$  is  
a) 3      b) 6y      c) 6x      d) 2
- The dividend received on 200 shares of face value ₹100 at 8% is  
a) ₹1600      b) ₹1000      c) ₹1500      d) ₹800

- (2)
14. The % of income on 7% stock at ₹80 is  
a) 9%                      b) 8.75%                      c) 8%                      d) 7%
  15. Median is same as  
a)  $Q_1$                       b)  $Q_2$                       c)  $Q_3$                       d)  $D_2$
  16. Probability of an impossible event is  
a) 1                      b) 0                      c) 0.2                      d) 0.5
  17. Correlation coefficient lies between  
a) 0 to  $\infty$                       b) -1 to 1                      c) -1 to 0                      d) -1 to  $\infty$
  18. The coefficient of correlation describes  
a) the magnitude and direction                      b) only magnitude  
c) only direction                      d) no magnitude and no direction
  19. The minimum value of the objective function  $Z = x + 3y$  subject to the constraints  $2x + y \leq 20$ ,  $x + 2y \leq 20$ ,  $x > 0$ ,  $y > 0$  is  
a) 10                      b) 20                      c) 0                      d) 5
  20. In critical path analysis the word CPM means  
a) critical path method                      b) crash project management  
c) critical project management                      d) critical path management

### Part - II

II. Answer any 7 questions. (Q.No.30 is compulsory)

7 x 2 = 14

21. Find  $\lambda$  if the matrix  $\begin{vmatrix} 1 & 1 & 3 \\ 2 & \lambda & 4 \\ 9 & 7 & 11 \end{vmatrix}$  has no inverse.
22. In how many ways 8 students can be arranged a) in a line b) along a circle
23. Prove that :  $\sin \theta \cos \theta \left\{ \sin\left(\frac{\pi}{2} - \theta\right) \csc \theta + \cos\left(\frac{\pi}{2} - \theta\right) \sec \theta \right\} = 1$
24. For the function  $y = x^3 + 19$ , find the values of  $x$  when its marginal value is equal to 27.
25. Find the market value of 62 shares available at ₹132 having the par value of ₹100.
26. Find the length of the tangent from (2,3) to the circle  $x^2 + y^2 + 8x + 4y + 8 = 0$
27. Differentiate :  $x^3 e^x$  w.r.t  $x$
28. A die is thrown. Find the probability of getting  
i) a prime number                      ii) a number greater than or equal to 3
29. Draw the network for the project whose activities with their relationships are given below :  
Activities A, D, E can start simultaneously  
 $B, C > A$  ;  $G, F > D, C$  ;  $H > E, F$
30. Write any 2 properties of regression coefficients.

### Part - III

III. Answer any 7 questions. (Q.No.40 is compulsory)

7 x 3 = 21

31. Solve by Matrix inversion method :  $2x + 3y - 5 = 0$  ;  $x - 2y + 1 = 0$
32. If  $nPr = 360$ , find  $n$  and  $r$ .

(3)

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33. Find the value of 'a' for which the straight lines  $3x + 4y = 13$ ;  $2x - 7y = -1$  and  $ax - y - 14 = 0$  are concurrent.
34. If the production of a firm is given by  $P = 4LK - L^2 + K^2$ ,  $L > 0$ ,  $K > 0$ , prove that

$$L \frac{\partial P}{\partial L} + K \frac{\partial P}{\partial K} = 2P$$

35. Prove that  $\tan^{-1}\left(\frac{4}{3}\right) - \tan^{-1}\left(\frac{1}{7}\right) = \frac{\pi}{4}$
36. A person deposits ₹4000 in the beginning of every year. If the rate of compound interest is 14% then, find the amount after 10 years.  $[(1.14)^{10} = 3.707]$
37. From a pack of 52 cards, two cards are drawn at random. Find the probability that one is a king and the other is a queen.
38. From the following data, calculate the correlation coefficient  
 $\Sigma xy = 120$ ,  $\Sigma x^2 = 90$ ,  $\Sigma y^2 = 640$
39. If  $y = A \sin x + B \cos x$  then prove that  $y_2 + y = 0$
40. Draw the network diagram for the following activities :

Activity code	A	B	C	D	E	F	G
Predecessor activity	-	-	A	A	B	C	D, E

#### Part - IV

#### IV. Answer all the questions.

7 x 5 = 35

41. a) Suppose the inter-industry flow of the product of two sectors X & Y are given as under.

Production Sector	Consumption Sector		Domestic demand	Gross output
	X	Y		
X	15	10	10	35
Y	20	30	15	65

(OR)

- b) Show that the pair of straight lines  $4x^2 - 12xy + 9y^2 + 18x - 27y + 8 = 0$  represents a pair of parallel straight lines and find their separate equations.
42. a)  $5^{2n} - 1$  is divisible by 24 for all  $n \in \mathbb{N}$ .

(OR)

- b) The demand for a commodity A is  $q = 80 - P_1^2 + 5P_2 - P_1P_2$ , find the partial

elasticities  $\frac{E_q}{E_{P_1}}$  and  $\frac{E_q}{E_{P_2}}$  when  $P_1 = 2$ ,  $P_2 = 1$

43. a) Find the means of X and Y variables and the coefficient of correlation between them from the following two regression equations  
 $4X - 5Y + 33 = 0$ ;  $20X - 9Y - 107 = 0$

(OR)



(4)

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- b) Find the amount at the end of 12 years of an annuity of ₹5000 payable at the beginning of each year, if the money is compounded at 10% per annum.

$$[(1.1)^{12} = 3.1384]$$

44. a) A dealer has to supply his customer with 400 units of a product per every week. The dealer gets the product from the manufacturer at a cost of ₹50 per unit. The cost of ordering from the manufacturers is ₹75 per order. The cost of holding inventory is 7.5% per year of the product cost.

Find (i) EOQ and (ii) Total optimum cost

(OR)

- b) If  $A + B = 45^\circ$ , prove that  $(1 + \tan A)(1 + \tan B) = 2$  and hence deduce the value of  $\tan 22\frac{1}{2}^\circ$

45. a) If  $y = 500 e^{7x} + 600 e^{-7x}$  then show that  $y_2 - 49y = 0$

(OR)

- b) Find the coefficient of correlation for the following :

X	78	89	96	69	59	79	68	62
Y	121	72	88	60	81	87	123	92

46. a) Find out the coefficient of mean deviation about median in the following series.

Age in years	0-10	10-20	20-30	30-40	40-50
No. of persons	8	12	16	20	37

  

50-60	60-70	70-80
25	19	13

(OR)

- b) Find the vertex, focus, axis, directrix and the length of latus rectum of the parabola  $y^2 - 8y - 8x + 24 = 0$
47. a) Solve the following linear programming problem by graphical method :
- Minimize  $Z = 20x_1 + 40x_2$  subject to the constraints  $36x_1 + 6x_2 \geq 108$   
 $3x_1 + 12x_2 \geq 36$ ,  $20x_1 + 10x_2 \geq 100$  and  $x_1, x_2 \geq 0$

(OR)

- b) A factory has 3 machines  $A_1, A_2, A_3$  producing 1000, 2000, 3000 screws per day respectively.  $A_1$  produces 1% defectives,  $A_2$  produces 1.5% and  $A_3$  produces 2% defectives. A screw is chosen at random at the end of a day and found defective. What is the probability that it comes from machines  $A_1$ ?

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